

Claims

1.

1 A child-resistant closure and container package that includes:
2 a container having as finish with at least one external thread and pockets in said
3 external thread, and
4 a closure having a base wall, a peripheral skirt with at least one internal thread,
5 lugs on said internal thread for receipt in said pockets, and a spring element for engagement with
6 said finish to bias said closure away from said finish and urge said lugs into said pockets,
7 one of said internal thread and said external thread having a circumferentially
8 facing axially extending stop at an end of said one thread, and the other of said internal thread
9 and said external thread having an abutment face at an end of said other thread for abutment with
10 said stop to prevent over-tightening of said closure on said finish and over-compression of said
11 spring element.

2.

1 The package set forth in claim 1 wherein said axially extending stop is disposed
2 at a lower end of said external thread, and said internal and external threads are continuous single
3 threads that extend for at least 450°.

3.

1 The package set forth in claim 1 wherein said axially extending stop is disposed
2 at an upper end of said internal thread, and said internal and external threads are dual threads,
3 with each thread extending for at least 180°.

4.

The package set forth in claim 1 wherein said abutment face is flat.

5.

1 The package set forth in claim 4 wherein said flat abutment face is disposed in a
2 plane diametrically of said closure.

6.

1 The package set forth in claim 5 wherein said stop is disposed at a lower end of
2 said at least one external thread and projects radially outwardly from said finish, and said
3 abutment face is disposed at a lower end of said at least one internal thread.

7.

1 The package set forth in claim 5 wherein said stop is disposed at an upper end of
2 said at least one internal thread adjacent to said base wall and projects radially inwardly from said
3 skirt, and said abutment face is disposed at an upper end of said at least one external thread.

8.

1 The package set forth in claim 1 wherein said pockets in said external thread do
2 not extend axially through said thread such that an upper surface of said thread is continuous
3 throughout said thread.

9.

1 The package set forth in claim 8 wherein said pockets and said lugs have opposed
2 angulated surfaces to cam said lugs over said pockets during application of said closure to said
3 finish, and opposed abutment surfaces to resist removal of said closure absent pressure on said
4 spring element.

10.

1 The package set forth in claim 8 wherein said closure, including said spring
2 element, is of integrally molded plastic construction.

11.

1 The package set forth in claim 10 wherein said spring element comprises a
2 circumferentially continuous conical lip that extends radially and axially inwardly from said base
3 wall adjacent to said skirt, said lip tapering in thickness from said base wall to a free end of said
4 lip.

12.

1 The package set forth in claim 11 wherein said lip has a rounded free edge for
2 engagement with said container finish.

13.

1 The package set forth in claim 12 further comprising a liner urged by said spring
2 element into engagement with said finish.

14.

1 The package set forth in claim 13 wherein said liner includes a base with metal
2 and plastic layers for induction sealing securement to said finish such that, upon removal of said
3 closure, said metal and plastic layers remain secured to said finish and said liner base is removed
4 with said closure.

15.

1 The package set forth in claim 13 wherein said liner is loosely captured by said
2 at least one internal thread within said closure adjacent to said base wall.

16.

1 A child-resistant closure and container package that includes:

2 a container having a finish with at least one external thread and pockets on an
3 undersurface of said external thread that do not extend axially through said thread such that an
4 upper surface of said external thread is continuous throughout said external thread, and

5 a closure having a base wall, a peripheral skirt with at least one internal thread and
6 lugs on said internal thread for receipt in said pockets, and a spring element for engagement with
7 said finish to bias said closure away from said finish and urge said lugs into said pockets.

17.

1 The package as set forth in claim 16 wherein said pockets and said lugs have
2 opposed angulated surfaces to cam said lugs over said pockets during application of said closure
3 to said finish, and opposed abutment surfaces to resist removal of said closure absent pressure
4 on said spring element.

18.

1 The package set forth in claim 16 wherein one of said internal thread and said
2 external thread having a circumferentially facing axially extending stop at an end of said one
3 thread, and the other of said internal thread and said external thread having an abutment face at
4 an end of said other thread for abutment with said stop to prevent over-tightening of said closure
5 on said finish and over-compression of said spring element.

19.

2 The package set forth in claim 18 wherein said stop is disposed at a lower end of
3 said at least one external thread and projects radially outwardly from said finish, and said
4 abutment face is disposed at a lower end of said at least one internal thread.

20.

2 The package set forth in claim 18 wherein said stop is disposed at an upper end
3 of said at least one internal thread adjacent to said base wall and projects radially inwardly from
4 said skirt, and said abutment face is disposed at an upper end of said at least one external thread.

21.

1 The package set forth in claim 18 wherein internal and external threads are
2 continuous single threads and extend for at least 360°.

22.

1 The package set forth in claim 18 wherein said internal and external threads are
2 double threads, with each thread extending for at least 180°.

23.

1 The package set forth in claim 16 wherein said closure, including said spring
2 element, is of integrally molded plastic construction.

24.

1 The package set forth in claim 23 wherein said spring element comprises a
2 circumferentially continuous conical lip that extends radially and axially inwardly from said base
3 wall adjacent to said skirt, said lip tapering in thickness from said base wall to a free end of said
4 lip.

25.

1 The package set forth in claim 24 wherein said lip has a rounded free edge for
2 engagement with said container finish.

26.

1 The package set forth in claim 16 further comprising a liner urged by said spring
2 element into engagement with said finish.

27.

1 The package set forth in claim 26 wherein said liner includes a base with metal
2 and plastic layers for induction sealing securement to said finish such that, upon removal of said
3 closure, said metal and plastic layers remain secured to said finish and said liner base is removed
4 with said closure.

28.

1 The package set forth in claim 26 wherein said liner is loosely captured by said
2 at least one internal thread within said closure adjacent to said base wall.

29.

1 A child-resistant closure and container package that includes:
2 a container having a finish with at least one external thread and pockets in said
3 thread,
4 a closure having a base wall, peripheral skirt with at least one internal thread and
5 lugs on said internal thread for receipt in said pockets, and a spring element for engagement with
6 said container finish to bias said closure away from said finish and urge said lugs into said
7 pockets, and
8 a liner urged by said spring element into engagement with said finish, said liner
9 including a base with metal and plastic layers for induction sealing securement to said finish such
10 that, upon removal of said closure, said metal and plastic layers remain secured to said finish and
11 said liner base is removed with said closure.

30.

1 The package set forth in claim 29 wherein said pockets in said external thread do
2 not extend axially through said thread such that an upper surface of said thread is continuous
3 throughout said thread.

31.

1 The package set forth in claim 30 wherein said pockets and said lugs have
2 opposed angulated surfaces to cam said lugs over said pockets during application of said closure
3 to said finish, and opposed abutment surfaces to resist removal of said closure absent pressure
4 on said spring element.

32.

1 The package set forth in claim 1 wherein one of said internal thread and said
2 external thread having a circumferentially facing axially extending stop at an end of said one
3 thread, and the other of said internal thread and said external thread having an abutment face at
4 an end of said other thread for abutment with said stop to prevent over-tightening of said closure
5 on said finish and over-compression of said spring element.

33.

1 The package set forth in claim 32 wherein said stop is disposed at a lower end of
2 said at least one external thread and projects radially outwardly from said finish, and said
3 abutment face is disposed at a lower end of said at least one internal thread.

34.

1 The package set forth in claim 32 wherein said stop is disposed at an upper end
2 of said at least one internal thread adjacent to said base wall and projects radially inwardly from
3 said skirt, and said abutment face is disposed at an upper end of said at least one external thread.

35.

1 The package set forth in claim 32 wherein internal and external threads are
2 continuous single threads and extend for at least 360°.

36.

1 The package set forth in claim 18 wherein said internal and external threads are
2 double threads, with each thread extending for at least 180°.

37.

1 The package set forth in claim 29 wherein said closure, including said spring
2 element, is of integrally molded plastic construction.

38.

1 The package set forth in claim 37 wherein said spring element comprises a
2 circumferentially continuous conical lip that extends radially and axially inwardly from said base
3 wall adjacent to said skirt, said lip tapering in thickness from said base wall to a free end of said
4 lip.

39.

1 The package set forth in claim 38 wherein said lip has a rounded free edge for
2 engagement with said liner and for engagement with said container finish when said liner is
3 removed after opening said package.

40.

1 The package set forth in claim 29 wherein said container is of integrally molded
2 plastic construction.

41.

1 The package set forth in claim 29 wherein said liner includes sequential layers of
2 cellulose, wax, metal and plastic, with said wax layer evaporating and said plastic layer melting
3 upon application of induction current to said metal layer.

42.

4 A closure that includes an integrally molded plastic body having a base wall, a
5 peripheral skirt with at least one internal thread and lugs on an upper surface of said thread, said
6 lugs having an angulated surface sloping toward an end of said thread remote from said base wall
and a circumferentially facing radially extending abutment surface on an end of said lugs facing
an opposing end of said thread, and a spring element for engagement with a container finish to
bias said lugs into opposing pockets on the container finish.

43.

1 The closure set forth in claim 42 wherein said spring element comprises a
2 circumferentially continuous conical lip that extends radially and axially inwardly from said base
3 wall adjacent to said skirt, said lip tapering in thickness from said base wall to a free end of said
4 lip for differential flexing upon engagement with a container finish.

44.

1 The closure set forth in claim 43 wherein said at least one internal thread is a
2 single thread that extends continuously for at least 450°.

45.

1 The closure set forth in claim 43 wherein said at least one internal thread is a
2 double thread, with each thread extending at least 190°.

46.

1 The closure set forth in claim 42 wherein said at least one internal thread has an
2 end remote from said base wall with a flat circumferentially facing radially extending end face.

47.

1 The closure set forth in claim 42 wherein said at least one internal thread has a
2 circumferentially facing axially extending stop projecting radially inwardly from said skirt at an
3 end of said thread adjacent to said base wall.

48.

1 The closure set forth in claim 42 further comprising a liner captured between said
2 thread and said spring element.

49.

1 The closure set forth in claim 48 wherein said liner includes sequential layers of
2 cellulose, wax, metal and plastic, with said wax layer evaporating and said plastic layer melting
3 upon application of induction current to said metal layer.

50.

1 A container that includes an integrally molded plastic body having a finish with
2 at least one external thread and pockets on an undersurface of said thread that do not extend
3 through said thread such that an upper surface of said thread is continuous throughout said
4 external thread.

51.

1 The container set forth in claim 50 wherein said pockets in said external thread
2 have a circumferentially extending axially angulated cam surface and a radially extending
3 abutment surface opposed to said cam surface.

52.

1 The container set forth in claim 50 wherein said container finish has a
2 circumferentially facing axially extending abutment stop at a lower end of said external thread
3 and projecting radially outwardly from said finish.

53.

1 The container set forth in claim 50 wherein said at least one external thread has
2 a flat circumferentially facing radially extending end face at an upper end of thread.

54.

1 The container set forth in claim 50 wherein said at least one external thread is a
2 single thread that extends for at least 455°.

55.

1 The container set forth in claim 50 wherein said at least one external thread is a
2 double thread, with each thread extending for at least 180°.

56.

1 A method of making a child-resistant closure and container package that includes
2 the steps of:

3 (a) providing a container having a finish with at least one external thread and
4 pockets in an undersurface of said thread,

5 (b) providing a closure of one-piece integrally molded plastic construction
6 having a base wall, a peripheral skirt with at least one internal thread and lugs on an upper
7 surface of said internal thread, and a spring element extending axially and radially inwardly from
8 said base wall adjacent to said skirt,

9 (c) positioning within said closure adjacent to said base wall a liner having
10 a base with sequential metal and plastic layers,

11 (d) securing said closure to said container finish such that said lugs are
12 disposed in said pockets and said spring element urges said liner into sealing engagement with
13 an axial end of said container finish, and then

14 (e) securing said liner to said axial end of said container finish by inducing
15 a current in said metal layer and melting said plastic layer onto said container finish.